

**ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)**  
**ORGANISATION OF ISLAMIC COOPERATION (OIC)**  
**Department of Computer Science and Engineering (CSE)**

MID SEMESTER EXAMINATION  
 DURATION: 1 HOUR 30 MINUTES

WINTER SEMESTER, 2022-2023  
 FULL MARKS: 75

**CSE 6275: Advanced Human Computer Interaction**

**Programmable calculators are not allowed. Do not write anything on the question paper.**

Answer **all 3 (three)** questions. Figures in the right margin indicate full marks of questions.

1. Suppose as an HCI expert you are part of a team developing a mental health application designed to provide personalized support to individuals dealing with anxiety and stress. This application aims to utilize Human-Centered Machine Learning (HCML) and Natural Language Processing (NLP) to enhance the overall user experience while promoting mental well-being.

*User Background:* The application is used by individuals of various ages and backgrounds seeking assistance in managing stress and anxiety. Users have different comfort levels with technology, and their mental health needs may vary significantly.

*User Interaction:* Users interact with the application through text and voice inputs, where they can share their thoughts, feelings, and concerns. The application provides responses and recommendations to help users cope with their emotions and reduce stress.

HCML and NLP can be strategically incorporated into the design of this mental health application to provide effective and empathetic support to users. Consider user-adaptive response, sensitive content detection, progress tracking and personalization, and user empowerment aspects to answer the following:

- |   |  |   |
|---|--|---|
| a)  | Explain how the application can employ HCML to adapt its responses to each user's emotional state and communication style.   | 6 |
| b)  | Describe how NLP can be used to identify potentially sensitive or alarming content in user inputs and provide appropriate interventions or referrals.                              | 6 |
| c)  | Discuss how the application can utilize HCML to track a user's progress over time and provide personalized coping strategies and exercises based on their history and preferences. | 7 |
| d)  | Explain how the application can empower users by helping them to understand their emotional patterns and offering self-help resources in a user-friendly manner.                   | 6 |
| 2. a) You are tasked with designing a user interface for a touch-based kiosk in a busy airport terminal. Passengers will use this kiosk to select their flight details and print boarding passes quickly and efficiently. The goal is to minimize errors and waiting times. |  |   |
| i.  | Provide a concise explanation of Fitts' Law, including its key components and how it relates to human-computer interaction.  | 4 |
| ii.   | Apply Fitts' Law principles to design a touch-based interface for the airport kiosk. Consider the following aspects:   | 6 |
|   | <ul style="list-style-type: none"> <li>• Selection targets (e.g., buttons, icons)</li> <li>• Placement of these targets on the screen</li> </ul>                                   |   |

Justify your design choices by explaining how they align with Fitts' Law ( $JD = \log_2(2D/W)$ ) and how they can contribute to a more efficient and error-reducing user experience at the airport kiosk.

- b) Imagine you are a usability consultant hired by a healthcare app development company. The company has developed a mobile app designed to help patients track their medication schedules and monitor their health conditions. However, they have received complaints from users about usability issues. 15

Explain the concepts of "Gulf of Evaluation" and "Gulf of Execution" in the context of user interactions with the healthcare app. Provide specific examples within this scenario to illustrate each concept. Then, discuss how these two gulfs are related to the four interaction problems: articulation, performance, presentation, and observation, as they pertain to the healthcare app.

3. a) In the context of designing an e-commerce fashion sales website with advanced human intention detection for personalized shopping experiences, identify whether the following goals primarily pertain to Usability (U) or User Experience (UX). Write the appropriate label (U or UX) for each of the following goals with justification in one sentence. 10+5

- i. Implementing clear and easily distinguishable navigation menus and buttons for intuitive interaction.
- ii. Reducing the number of steps in the checkout process.
- iii. Utilizing advanced algorithms to detect users' fashion intentions and offer personalized product recommendations.
- iv. Conducting usability testing to identify and address issues related to efficient navigation and task completion.
- v. Allowing users to customize their fashion intention preferences and the types of recommendations they receive.

After identifying the goals, perform a trade-off analysis between Usability (U) and User Experience (UX). Select two goals, one from Usability (U) and one from User Experience (UX), and discuss a potential trade-off that might arise between them. Consider factors like design complexity, resource allocation, or user preferences in your analysis.

- b) Explain how Donald Norman's six higher-level design principles - visibility, feedback, constraints, mapping, consistency, and affordance have been implemented in the user interface of the Google Map web application. Provide specific examples for each principle in a maximum of two-line sentences. 10